

What is claimed is:

1. A polishing tool for polishing an object, wherein the
5 polishing tool is comprised primarily by a thermoplastic resin.

2. A polishing tool according to claim 1, wherein the
polishing tool is a fixed-abrasive polishing tool that contains
abrading particles within the tool.

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3. A polishing tool according to claim 1, wherein the
polishing tool is a non-fixed-abrasive polishing pad.

4. A polishing tool according to claim 2, wherein the
15 abrading particles include cerium oxide (CeO_2), alumina (Al_2O_3),
silicon carbide (SiC), silicon dioxide (SiO_2), zirconia (ZrO_2),
iron oxides (FeO , Fe_2O_3), manganese oxide (MnO_2 , Mn_2O_3), magnesium
oxide (MgO), calcium oxide (CaO), barium oxide (BaO), zinc oxide
(ZnO), barium carbonate ($BaCO_3$), calcium carbonate ($CaCO_3$), diamond
20 (C), or a composite material comprised by those recited above.

5. A polishing tool according to claim 1, wherein the
polishing tool is formed by injection molding to charge a feed
material under pressure into a mold of a specific shape.

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6. A polishing tool according to claim 1, wherein a material
comprising the polishing tool further comprises an interface
activation agent.

7. A polishing tool according to claim 1, wherein a material comprising the polishing tool further comprises a hydrophilic substance or said material is modified by adding the hydrophilic substance.

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8. A fixed-abrasive polishing tool for polishing an object, said polishing tool comprising:

abrading particles; and

10 a resin for binding said abrading particles in a matrix of said resin, wherein said resin comprises thermoplastic resin.

9. A fixed-abrasive polishing tool according to claim 8, wherein the abrading particles include cerium oxide (CeO_2), alumina (Al_2O_3), silicon carbide (SiC), silicon dioxide (SiO_2), zirconia (ZrO_2), iron oxides (FeO , Fe_3O_4), manganese oxide (MnO_2 , Mn_2O_3), magnesium oxide (MgO), calcium oxide (CaO), barium oxide (BaO), zinc oxide (ZnO), barium carbonate (BaCO_3), calcium carbonate (CaCO_3), diamond (C), or a composite material comprised by those recited above.

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10. A fixed-abrasive polishing tool according to claim 8, wherein a porosity is formed in said polishing tool.

11. A fixed-abrasive polishing tool according to claim 10, 25 wherein a range of composition of fixed-abrasives (percentages of abrading particles (V_g), binder (V_b) and air porosity (V_p)) in volume percent (vol%) are: 10 %< abrading particles (V_g) <50 %, 30 %< binder (V_b) <80 %, and 0 %< air porosity (V_p) <40 %.

12. A method for making a fixed-abrasive polishing tool comprising:

using abrading particles and a thermoplastic resin as raw materials;

5 filling a forming fixture with a mixture of abrading particles and the thermoplastic resin into a mold; and forming the fixed-abrasive polishing tool.

13. A method according to claim 12, wherein said forming 10 is performed by heating-cooling the mixture and/or pressing the mixture.

14. A method according to claim 12, wherein said mixing of the abrading particles and the thermoplastic resin is carried out 15 prior to or during filling or after filling a forming fixture with the raw materials.

15. A method for making a fixed-abrasive polishing tool, said method comprising:

20 mixing powdery abrading particles or a slurry and raw materials of the thermoplastic resin to form a dispersion liquid; polymerizing or manufacturing the thermoplastic resin; and making a mixture containing the polymerized thermoplastic resin and the abrading particles in the dispersion liquid during 25 the step of polymerizing or manufacturing the thermoplastic resin.

16. A method according to claim 15, said method further comprising:

performing a mist drying step of said polymerized mixture.

17. A method according to claim 16, wherein said mist drying step comprising a spray drying step.

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18. A method according to claim 16, wherein said mixture is formed with particles by the mist drying step and a diameter of the particles is in a range of 1~500 μ m.

10 19. A method for making a fixed-abrasive polishing tool comprising:

mixing abrading particles and a resin in a liquid;
drying said mixed liquid to obtain dried mixed material; and
forming said dried mixed material into the fixed-abrasive
15 polishing tool.

20 20. A method according to claim 19, wherein said abrading particles are provided in a state of slurry.

20 21. A method according to claim 19, wherein said resin is provided in a state of powder and mixed with abrading particles in water or a solvent.

25 22. A method according to claim 19, wherein said resin is provided in a liquid state where the resin is dispersed or dissolved in water or a solvent.

23. A method according to claim 19, wherein said drying step

comprises a mist drying step.

24. A method according to claim 23, wherein said mist drying step is performed by a spray dryer.

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25. A method according to claim 19, wherein said polishing tool is formed by filling the said mixed powder into a mold.

10 26. A method according to claim 19, wherein pulverizing is performed to obtain a powder in a range of 1-500 μm during or after drying said mixed liquid.

27. A method for making a fixed-abrasive polishing tool comprising:

15 mixing abrading particles and a liquid resin to form a mixed liquid;

drying and comminuting said mixed liquid to obtain dried mixed material; and

20 forming said dried mixed material into the fixed-abrasive polishing tool.

28. A method according to claim 27, wherein abrading particles are provided as a powder or dried slurry.

25 29. A method according to claim 28, wherein said drying step of slurry comprises a spray drying step.

30. A method for making a fixed-abrasive polishing tool

comprising:

mixing powder of abrading particles and a powder of resin
in a liquid to form a mixed liquid;

5 drying and comminuting said mixed liquid to obtain dried
mixed material; and

forming said dried mixed material into the fixed-abrasive
polishing tool.

31. A method according to claim 30, wherein said liquid
10 comprises water or a solvent.

32. A method according to claim 31, wherein said powder of
abrading particles is obtained by drying slurry.

15 33. A method according to claim 32, wherein said drying step
of slurry comprises a spray drying step.

34. A method for making a fixed-abrasive polishing tool
comprising:

20 mixing slurry containing abrasive particles and a liquid
resin to form a mixed liquid;

drying said mixed liquid to obtain dried mixed material; and
forming said dried mixed material into the fixed-abrasive
polishing tool.

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35. A method according to claim 34, wherein said forming
is performed by molding said dried mixed material into a mold.

36. A method according to claim 34, wherein said drying step comprises a mist drying step.

37. A method according to claim 34, wherein said drying step 5 comprises a spray drying step.

38. A polishing apparatus for polishing a semiconductor wafer, comprising:

a topring for holding the wafer; and
10 a polishing tool, said polishing tool comprised primarily by a thermoplastic resin.

39. A polishing apparatus according to claim 38, wherein said semiconductor wafer has patterns comprised by high portions 15 and low portions.

40. A polishing apparatus for polishing a semiconductor wafer, comprising:

a topring for holding the wafer; and
20 a fixed-abrasive polishing tool, said polishing tool comprising abrading particles and a resin for binding said abrading particles in a matrix of said resin, said resin comprises thermoplastic resin.

25 41. A polishing apparatus according to claim 40, wherein a range of composition of fixed-abrasive polishing tool (percentages of abrading particles (Vg), binder (Vb) and air porosity (Vp)) in volume percent (vol%) are: 10 %< abrading

particles (V_g) < 50 %, 30 % < binder (V_b) < 80 %, and 0 % < air porosity (V_p) < 40 %.

42. A polishing apparatus according to claim 40, wherein
5 said semiconductor wafer has patterns comprised by high portions
and low portions.

43. A polishing apparatus according to claim 40, further
comprising: a dresser for dressing a polishing surface of said
10 fixed-abrasive polishing tool.

44. A polishing apparatus according to claim 40, wherein
said fixed-abrasive polishing tool is mounted on a base.

15 45. A polishing apparatus according to claim 44, wherein
a polishing tool comprised by said fixed-abrasive polishing tool
and said base is mounted detachably on a polishing table.

46. A polishing apparatus according to claim 45, wherein
20 said polishing tool is fixed to said polishing table by clamps.

47. A polishing apparatus for polishing a semiconductor
wafer, comprising:

at least one topring for holding the wafer; and
25 at least two polishing tables providing polishing surfaces
respectively, wherein one of said polishing table having a
fixed-abrasive polishing tool, said polishing tool comprising
abrading particles and a thermoplastic resin for binding said

abrading particles.

48. A method of polishing a substrate comprising:
polishing the substrate firstly by a fixed-abrasive
5 polishing tool, said polishing tool comprising abrading particles
and a thermoplastic resin for binding said abrading particles; and
finishing the substrate secondly by a finishing pad.

49. A method according to claim 48, wherein said first
10 polishing is performed by supplying liquid not containing abrading
particles.

50. A method according to claim 48, wherein said first
polishing is performed by supplying water containing additive
15 agent.

51. A method according to claim 48, wherein said finishing
step is performed by supplying water.